

What is claimed is:

1. A hash compensation architecture for a network device, comprising:

a hashing mechanism for generating a hash index and a compensation index in  
5 response to a network address of an incoming packet;

an address lookup table for recording network address information and generating  
an associated output port for said incoming packet in response to said hash index;

a validity table for storing valid bit information of each directory entry of said  
address lookup table;

10 a translating/comparing mechanism coupled to said validity table for obtaining a  
local best-fit directory entry in said address lookup table by continuously translating and  
comparing each directory entry of said validity table according to a predetermined  
format; and

a compensation directory coupled to said translating/comparing mechanism for  
15 storing said local best-fit directory entry output from said translating/comparing  
mechanism and causing said address lookup table to generate an associated output port  
for said incoming packet in response to a mapping of said compensation index.

2. The hash compensation architecture for a network device as claimed in claim 1,  
20 wherein said translating/comparing mechanism comprises:

a plurality of translators each for receiving  $k$ -bit valid bits input and an address of a  
valid directory entry of a set and generating an output in accordance with said  
predetermined format, said predetermined format defined by:

an address field for storing an address of a directory entry of a set;

25 a compensation field for indicating if an address stored in said address field  
can be provided for said compensation directory ;

a counter field for indicating the number of valid directory entries of a set  
mapped by said address stored in said address field;

30 a selection field for indicating the order of the leftmost "1" of a valid  
directory entry mapped by said address stored in said address field; and

a source field for indicating the provider of said address stored in said address field;

a comparator circuit for continuously comparing the outputs of said plurality of translators and selecting an output with a local best-fit directory entry; and

means for storing said output with a local best-fit directory entry.

3. The hash compensation architecture for a network device as claimed in claim 1, wherein said compensation directory comprises:

a plurality of directory entries and associated network addresses for indexing said address lookup table.

4. The hash compensation architecture for a network device as claimed in claim 1, wherein said valid bit information of said validity table is at least 1 bit.

5. The hash compensation architecture for a network device as claimed in claim 1, wherein said compensation directory periodically performs an aging out process.

6. The hash compensation architecture for a network device as claimed in claim 5, wherein said address lookup table periodically performs an aging out process on any directory entry which is currently not indexed by said compensation directory.

7. The hash compensation architecture for a network device as claimed in claim 1, wherein said valid bit information of said validity table is two-bit for representing the statuses of not-compensated, idle, compensated steeling, and compensated occupied.

8. In a network device having a hash compensation architecture, a method for looking up an address lookup table comprising the steps of:

concurrently generating a hash index and a compensation index in response to a network address of an incoming packet;

using said hash index to look up an address lookup table and cause said address

lookup table to output an associated output port for forwarding said incoming packet;  
and

simultaneously using said compensation index to lookup a compensation directory  
and cause said compensation directory to output an associated address for indexing said  
5 address lookup table and causing said address lookup table to output an associated  
output port for forwarding said incoming packet.

9. The method for looking up an address lookup table as claimed in claim 8, wherein  
said compensation directory stores data from said address lookup table when an  
10 overflow occurs while said address lookup table is performing network address  
learning.

10. The method for looking up an address lookup table as claimed in claim 8, further  
comprising the steps of:

15 building a validity table according to valid bit information of each directory entry  
of a set in said address lookup table;

continuously searching and translating each entry of said validity table entry into a  
predetermined format for comparison;

selecting a local best-fit directory entry from each comparison result of said

20 searching and translating step; and

storing a local best-fit directory entry to provide for said compensation directory .

11. The method for looking up an address lookup table as claimed in claim 8, further  
comprising the step of:

25 periodically performing an aging out process for said compensation directory .

12. The method for looking up an address lookup table as claimed in claim 8, further  
comprising the steps of:

directly deleting any directory entry of said address lookup table when said  
30 directory entry is time-out and not recorded in said compensation directory ; and

deleting any directory entry in said compensation directory when said directory entry is time-out and recorded in said compensation directory .